

### **ABSTRACT**

**[0084]** An actuator for use with active noise control (ANR). The present invention satisfies design goals commensurate with active noise reduction devices used in small enclosed volumes and moderate-to-high noise environments. An ANR voice coil speaker is cylindrical in shape, with a diaphragm to motor diameter less than unity and fits into the ear canal. The rear cavity volume is on the same order of magnitude as the volume of the front cavity defined by the space between the diaphragm and the eardrum. The relatively balanced front/back volume of the ANR speaker reduces the required force to achieve a specific displacement required for high sound pressure output. An ANR balanced armature actuator uses a modified cabinet design, and a segmented or stiffened diaphragm made of light materials, and a sheet-type coupling between the armature and the diaphragm to reduce or eliminate resonances and phase lag within a desired control band. The actuator for use with ANR is well suited for an earplug that has been designed to provide active noise reduction in the ear canal.